Intersection Delay Study

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General

There are several types and descriptions of traffic delay involving intersections. The type being addressed in this section is stopped-time delay, also known as stopped delay, which is the time that vehicles are waiting in line on the approach to an intersection. Although estimates of intersection delay can be made with computer software, there can be a need to perform a field study at an operating intersection. Uses for the data include capacity analysis, signal warrant analysis and multi-way stop consideration. One of the criteria for multi-way stop consideration is an average delay to minor-street traffic of at least 30 seconds per vehicle during the highest hour. The peak hour signal warrant requires that the total stopped time delay experienced by the traffic on one minor street approach (one direction only) controlled by a stop sign equals or exceeds: 4 vehicle-hours for a one-lane approach; or 5 vehicle-hours for a two-lane approach. This study also provides the Percent of Vehicles Stopped, which is a useful indicator of signalized intersection performance.

Procedure

The field survey portion of the study must include the four highest consecutive fifteen-minute periods. It should be done, insofar as possible, under normal conditions involving the weather, nearby traffic generator schedule, etc. Two observers are needed, one to count and record the stopped vehicles at 15-second intervals and the other to count the number of approach vehicles in 15-minute intervals. For multiple lane approaches or long queues, a third observer that will concentrate entirely on counting stopped vehicles, will be needed. The procedure is based on the assumption that each vehicle was stopped for the entire fifteen-second interval.

The observers must be strategically positioned so as to be able to see the entire approach. The observers' location and actions must not distract motorists or influence their behavior. The observers must arrive at the study site early enough to evaluate conditions, choose a location from which to gather the data, and practice the study technique long enough to be comfortable in the knowledge that the gathered data will be accurate. Enough copies of Form 1, Intersection Delay Study Field Sheet for the entire study must be labeled and ready for use since there will not be time to organize them during the study.

Safe, efficient and effective data collection requires skill, attention to detail and common sense. The observer must concentrate his or her attention on accurately recording each count in the proper place or with the proper button. Observers should look for and note any temporary traffic events such as maintenance activities, funeral processions or crashes that may lead to unusual traffic patterns, causing the data for that period of time to be unusable. Observers should count those vehicles with locked wheels as being stopped as well as vehicles that had been stopped and are creeping forward in a queue that is not discharging.

Method

One observer records a count of the number of stopped vehicles in each fifteen-second interval of time for each minute of the study time on Form 1, Intersection Delay Study Field Sheet. The other observer counts the number of vehicles that stopped and the number that did not stop and gives them to the first observer for recording in 15-minute intervals on Form 1. A timing device such as a cassette recorder with an audible cue at the 15-second intervals can be very helpful so that it is not necessary for a member of the team to read a watch at each interval.

The total count of stopped vehicles during all intervals multiplied by the length of the 15-second time interval provides the Total Stopped Delay Time in vehicle-seconds. Dividing the Total Stopped Delay Time in the highest hour by the number of seconds in that time period (3600) provides the number of hours of delay for checking the peak hour signal warrant.

Dividing the Total Stopped Delay Time by the number of stopped vehicles provides the Average Delay per Stopped Vehicle. Dividing the Total Stopped Delay Time by the Approach Volume provides the Average Delay per Approach Vehicle and is the number used in checking the multi-way stop criteria.

At a stop-controlled approach the column for Number Not Stopped will not normally be used and the Delay per Stopped Vehicle and Delay per Approach Vehicle will be the same. Also the Percent of Vehicles Stopped is not normally used for stop-controlled approaches.

Form 2, Intersection Delay Study, is used to combine the data from the four highest consecutive fifteen-minute periods into peak hour data.

Documentation

For many studies, the findings, conclusions and recommendations must be clearly conveyed to those who are responsible for acting on the results. This is done through the use of a memo, letter or more formal report. The documentation for an Intersection Delay Study should include when, where and by whom the study was conducted, and that it was done in conformance with established guidelines. The data can be presented through the use of Form 1, Intersection Delay Study Field Sheet and Form 2, Intersection Delay Study, or forms generated by the use of an electronic count board or computer.

Form 1

Intersection Delay Study Field Sheet

Date_____ Location _____

Approach_____ Movement(s) _____Lanes_____

Delay Observer _____

Count Observer_____

Recorder_____

Begin 15-Minute Interval: Hour_____ Minute_____

Total Delay_____ Vehicle-Seconds

Total Delay_____ Vehicle-Hours

Average Delay per Stopped Vehicle_____ Vehicle-Seconds/Vehicle

Average Delay per Approach Vehicle_____ Vehicle-Seconds/Vehicle

Percent of Vehicles Stopped_____

	Total Number of Vehicles Stopped in the Approach at Time				Approach Volume	
Time Starting At Min.	**+0 sec**	**+15 sec**	**+30 sec**	**+45 sec**	**Number Stopped**	**Number Not Stopped**
Subtotal						
Total						

Total Delay = Total Number Stopped at Time Intervals multiplied by Sampling Interval (15 seconds)

Average Delay per Stopped Vehicle = Total Delay divided by Number Stopped

Average Delay per Approach Vehicle = Total Delay divided by Total Approach Volume

Percent of Vehicles Stopped = Number Stopped divided by Approach Volume

Form 2

Intersection Delay Study

Date_____ Location _____

Approach._____ Movement(s) _____Lanes_____

Delay Observer _____

Count Observer_____

Recorder_____

Peak Hour: Begin Hour_____ Minute_____ End Hour_____ Minute_____

Total Delay_____ Vehicle-Seconds

Total Delay_____ Vehicle-Hours

Average Delay per Stopped Vehicle_____ Vehicle-Seconds/Vehicle

Average Delay per Approach Vehicle_____ Vehicle-Seconds/Vehicle

Percent of Vehicles Stopped_____

	Total Number of Vehicles Stopped in the Approach at Time				**Approach Volume**	
Time Starting At Min.	**+0 sec**	**+15 sec**	**+30 sec**	**+45 sec**	**Number Stopped**	**Number Not Stopped**
Subtotal						
Total						

Total Delay = Total Number Stopped at Time Intervals multiplied by Sampling Interval (15 seconds)

Average Delay per Stopped Vehicle = Total Delay divided by Number Stopped

Average Delay per Approach Vehicle = Total Delay divided by Total Approach Volume

Percent of Vehicles Stopped = Number Stopped divided by Approach Volume

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